

REMARKS

The Office Action dated May 11, 2006 has been received and carefully noted. The above amendments and the following remarks are being submitted as a full and complete response thereto. The Applicants respectfully request reconsideration of this application in view of the foregoing amendments and the following remarks.

By the foregoing Amendment, Claims 7 and 11 have been amended. Claims 9 and 14 have been canceled without prejudice or disclaimer. The Applicants submit that the amendments to the claims are fully supported in the specification as originally filed, and that no new matter has been added. Thus, Claims 7, 11, and 13 are currently pending in the application and are subject to examination.

Claim Objections

Claims 7 and 11 are objected to as containing informalities. Specifically, the Office Action objects to the phrase "all side surfaces" because the pellet in the present invention only shows three sides that have fine projections or rough surfaces. Applicants respectfully traverse the objection.

Claim 7 recites, in part, "characterized in that the major front surface is a rough surface; and characterized in that all side surfaces of the pellet are rough surfaces." Claim 11 recites, in part, "to form fine projections on the major front surface and all side surfaces of the pellet." Applicants submit that "all side surfaces" does not refer to "all surfaces" but merely to those surfaces labeled as "side surfaces." Figure 1 clearly labels two side surfaces, 8a and 8b, a major front surface 6 that is a rough surface, a major rear surface 7, and two side surfaces not shown (see Specification, page 8, lines 1-5, page 9,

lines 7-11, and Fig. 1). The major rear surface 7 is not a “side surface” as recited in Claims 7 and 11.

Accordingly, the Applicants respectfully request reconsideration and withdrawal of the objection.

Claims 7, 11, and 13 Recite Patentable Subject Matter

Claims 7 and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Shibata et al. (JP 04-042582, hereinafter “Shibata”) in view of Brunner (U.S. Patent No. 5,742,098). Claims 11, 13, and 14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Shibata in view of Brunner and further in view of Nishiwaki et al. (Japanese Patent Application Publication No. 59085868 A, hereinafter “Nishiwaki”). Claims 9 and 14 have been canceled, thus rendering the rejections moot. To the extent these rejections remain applicable to the claims currently pending, the Applicants respectfully traverse the rejections with respect to Claims 7, 11, and 13.

Claim 7, as amended, recites a light emitting diode comprising a pellet, a major front surface, of which where an electrode is formed, is made of a GaAsP mixed crystal, characterized in that the major front surface is a rough surface, and that all side surfaces of the pellet are rough surfaces, wherein the rough surfaces are formed with fine projections having a diameter in a range of 0.3 μ m to 3 μ m.

Claim 11, as amended, recites a fabrication process for a light emitting diode having a pellet, a major front surface of which, where an electrode is formed, is made of a GaAsP mixed crystal, characterized in that the pellet is treated with an etching solution of an aqueous solution containing Br₂, nitric acid, hydrofluoric acid, and acetic acid or I₂,

nitric acid, hydrofluoric acid, and acetic acid to form fine projections on the major front surface and all side surfaces of the pellet, wherein the fine projections have a diameter in the range of 0.3 μ m to 3 μ m.

Thus, the amended claims now recite a diameter of the projection of the rough surface in a range of 0.3 μ m to 3 μ m, as set forth in originally-filed Claims 9 and 14, and now incorporated into Claims 7 and 11.

The Office Action admits that none of the references teach that "the surfaces of the pellet are roughened with fine projections having a specific range" (see Office Action, page 5). The Office Action takes the position that it would have been obvious to provide a specific range for the rough surfaces.

However, under U.S. patent practice, optimization of ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges are critical. See M.P.E.P. 2144.05.II.A. In this case, the Applicants respectfully submit that the claimed ranges of the diameter of the fine projections provide critical and non-obvious advantages over the prior art.

When the diameter of the fine projections of the pellet are adjusted to a range of 0.3 μ m to 3 μ m, the probability of total reflection of the light decreases to a satisfactory amount. This improves light extraction efficiency (see specification, page 6, lines 5-10).

This is because the diameter in a range of from 0.3 μ m to 3 μ m is about the same as light wavelengths of a GaAsP mixed crystal, and therefore the projection surface to the light wavelength does not work as a mirror surface. If the diameter of the fine projections of the rough surfaces is larger than 3 μ m, the projection surface to the light wavelength is so

gentle as to locally work as a mirror surface (see specification, page 7, lines 16-18, and Fig. 3(B)). On the other hand, if the diameter of the fine projections formed on the rough surfaces is smaller than 0.3 μm , the projection level to the light wavelength is so small, as to become substantially a mirror surface (see specification, page 7, lines 18-20, and Fig. 3(C)).

The Applicants note that the term "a diameter of a fine projection" used in the present invention refers to a length from the foot of a projection to the foot of the next projection, as shown in Fig. 3 (see specification, page 7, lines 21-23). Thus, it is clear that the claimed range is critical.

Since none of the cited references discloses this critical range of the diameter of the fine projections of the rough surfaces, it is clear that none of the cited references as the advantageous effects of the claimed invention, for example, those advantages found on page 14 of the disclosure. Therefore, it is clear that the presently claimed invention has unexpected results over the cited references.

For at least the reasons listed above, the Applicants thus submit that it would not have been obvious to modify the applied prior art to teach the claimed invention. Accordingly, Shibata, Brunner, and Nishiwaki, alone or in any combination thereof, do not teach or suggest all the elements of Claims 7 and 11. Accordingly, the Applicants respectfully submit that Claims 7 and 11 are allowable over the applied prior art.

As Claim 11 is allowable, the Applicants submit that Claim 13, which depends from Claim 11, is likewise allowable for at least the same reasons that Claim 11 is allowable, as well as for the additional subject matter recited therein.

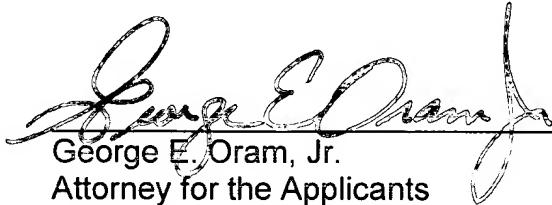
Conclusion

Applicants respectfully submit that this application is in condition for allowance and such action is earnestly solicited. If the Examiner believes that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below to schedule a personal or telephone interview to discuss any remaining issues.

In the event that this paper is not considered to be timely filed, an appropriate extension of time is requested. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account Number 01-2300, referencing **Docket Number 107242-00005**.

Respectfully submitted,

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